| Diploma Programme subject outline—Group 5: mathematics and computer science | | | | | | | | | | |
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| School name | Hellgate High School | | | | | | School code | 922669 | | |
| Name of the DP subject | Mathematical Studies SL | | | | | | | | | |
| Level  (indicate with X) |  |  | Standard completed in two years | |  | Standard completed in one year \* | | |  |  |
| Higher |  | Standard completed in two years | | X | Standard completed in one year \* | | |  |  |
|  |  | Standard completed in two years | |  | Standard completed in one year \* | | |  |  |
| Name of the teacher who completed this outline | Lee Brown | | | **Date of IB training** | | | 2-December-2010 - 4-December-2010 | | | |
| **Date when outline was completed** | December 2011 | | | **Name of workshop**  (indicate name of subject and workshop category) | | | FLIBS | | | |

\* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

* Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.
* This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.
* This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.
* If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

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| One class is |  | minutes. |
| 50 |
| In one week there are |  | classes. |
| 5 |
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| Year 1 | Presumed Knowledge | Numbers, fractions, algebra, geometry, trigonometry, financial mathematics, statistics | 3 hours | | | Evaluation in Mathematical Studies IB will include the required informal and formal IB assessments as well as an exclusive site based assessment.  Formal assessment in Math Studies SL is broken down into External Assessment (EA) and Internal Assessment. Within the category of EA the students will be expected to write 2 papers (Paper 1 and Paper 2) each worth 40% of his or her grade. The remaining 20% will rely on the Math Studies Project. The project will be introduced numerous times in year one and year two as various subjects are introduced to the class. At the start of year two the project will be introduced formally with time given in class to explore possible questions and topics. Old projects will be shared with the class for the students to understand both the scope of the exercise and the rubric of evaluation. Deadlines for the project will be determined in conjunction with the IB coordinator to ensure reasonable spacing between subject due dates for IB students.  Students will receive school based assessment for site based reporting at the end of the 4 terms. The units in Mathematical Studies SL will be designed to reflect the attributes of the IB learner and every opportunity to encourage the inclusion and exploration of these characteristics will be taken. Each unit will begin with an ICT introduction (ex. power point, video, TED talk) to provide historical, international and cultural relevance to the topic. The learning outcomes of each unit and unit time line will be provided to each student and clarified buy the teacher. This will be followed by a survey quiz that will provide informal feedback to the student and the teacher regarding previous experience and skill sets associated with the unit objectives. This exercise will provide clarity to the teacher and the student if extraordinary support is required in certain areas. Each unit will include daily homework, weekly math challenges, bi-weekly quizzes, and frequent journal entries. Lessons will be designed with the learner profile in mind to ensure a holistic and inclusive approach to the course objectives. The learning strategies will include individual as well as group based explorations. Student self/group assessment will also be encouraged where appropriate. Many of these exercises will also be evaluated using the criterion based assessment techniques used in formal IB assessment. All assignments will be evaluated as per the school assessment policy. This will allow students to become familiar with IB evaluation strategies. At the end of each unit the students will be given a unit test to demonstrate their understanding of the topic being explored. For both year one and year two the students’ school based assessment will be broken down into 70% for tests and quizzes and 30% for assignments. This overall standing will provide the basis for the report card mark.  This course outline will be posted on the school website. | **TEXTBOOK:**  Mathematics Studies by Ron Carrell and David Wees |
| Introduction to Graphic Display Calculator (GCD | Arithmetic calculations, use of the GDC to graph a variety of functions  General settings and formatting.  Graph, table, statistics and finance modes.  Appropriate choice of “window”; use of “zoom” and “trace” (or equivalent) to locate points to a given accuracy.  Explanations of commonly used buttons. Entering data in lists. | 3 hours | | |
| Number and Algebra | Organization of numbers (natural, rational, real, etc.), Approximation and how it’s affected by these number systems. Standard form and scientific notation. SI and other basic units of measurement. Solve systems of linear and quadratic equations | 14 hours | | |
| Sets Logic and Probability | Understand set theory, represent sets of Venn diagrams, use Venn diagrams in solving problems.  Understand the basic logical connective that all arguments share, show how to write these statements using symbolic logic, analyse the truth value of logical statements using truth tables, define some properties of logical arguments, explain how we can use these properties of further examine logical statements.  Draw and use Venn diagrams, tree diagrams and tables of outcomes to solve problems, solve problems involving classical probability, find the probability of a complementary event, use the laws of probability to solve problems involving; mutually exclusive events, combined events, independent events, dependent events, understand and use the concept of conditional probability to solve problems, understand the concept of the probability of ‘at least one’ to solve problems, understand the relationship between independent and mutually exclusive events. | 15 hours | | |
| Geometry and Trigonometry | Midpoint of a line, distance between points, given their coordinates, represent the equation of lines in two dimensions, the gradients and intercepts of lines, points of intersection of lines, how to tell if lines are parallel or perpendicular, by examining their gradients.  Coordinates in two dimensions: point; lines; midpoints.  Use the sine and cosine rules, find side lengths and angles of triangles, area of triangles and other two-dimensional shapes, and apply principles of trigonometry to problems involving three-dimensional shapes.  . | 15 hours | | |
| Year 2 | Statistics | Classify data as discrete, continuous, nominal, ordinal, interval  Organize discrete data into frequency tables, graph discrete data as a frequency polygon, organize continuous data into frequency tables, graph continuous data as histograms, organize continuous data into cumulative frequency tables, graph continuous data as cumulative frequency curves, solve problems involving the measures of central tendency; mean, median and mode, solve problems involving the measures of dispersion; range interquartile range and standard deviation.  Understand the difference between descriptive statistics and inferential statistics, understand the concept of correlation, interpret the correlation as strong, weak or none, draw a scatterplot, draw a line of best fit by eye, draw a line of best fit through the mean point, predict values using the graph and the regression equation, understand the basic concepts of hypothesis testing , write the null and alternative hypothesis, find expected frequencies, degrees of freedom and critical values, determine if two variables are independent of each other by performing the chi-square test for independence. | 25 hours | | |  |  |
| Introduction to Differential Calculus | Understand the relationship between the gradient of a function and its rate of increase, define the derivative of a function and show how to calculate it for a variety of different functions, analyze the graph of a function using its derivative to determine the properties of the function, apply differential calculus to real-life problems | 16 hours | | |
| Financial Maths | Convert one type of currency to another, and calculate commission charges on such transactions, discuss simple and compound interest on such things as loans and investments, understand inflation, appreciation and depreciation, use your calculator effectively and efficiently to perform a variety of financial calculations | 10 hours | | |
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1. IB internal assessment requirement to be completed during the course

Briefly explain how and when you will work on it. Include the date when you will first introduce the internal assessment requirement to your students, the different stages and when the internal assessment requirement will be due.

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| In September of year one the project would be introduced to students. Discussions throughout the first 9 weeks would include the concept of mathematical models and mathematical inquiry whereby students would be encouraged to reflect on and investigate areas of interest.  Samples of other projects will be given to students. Evaluation of and expectations of projects will be discussed so students will be aware of the expectation of the Math Studies Project.  In September of year two students would once again be given projects from previous years which will be discussed. Students then will work with the teacher and other facilitators such as the media specialist to help them arrive at a topic of interest. A time line will be given with the project broken down into specific blocks and as the year progression projects will be evaluated at the end of each of these blocks to determine how their projects are progressing. |

1. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

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| Topic | Link with TOK (including description of lesson plan) |
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1. International mindedness

Every IB course should contribute to the development of international mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

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| Topic | Contribution to the development of international mindedness (including resources you will use) |
| Graphical Representations in Statistics | Students enter Math Studies SL with many preconceived ideas about the world and its populations, some of them accurate some of them not. How does one go about testing, researching and analysing these ideas to gain confidence and become critical thinkers? With the current access to “big data” students abilities to do their own research and analyse such data using powerful software has never been more accessible.  Hans Rosling has several videos on TED.com. (Hans Rosling shows the best stats you’ve ever seen, Hans Rosling’s new insights on poverty) that demonstrates how the world has changed over time using a very unique piece of statistical software Students will be encouraged to do their own research and collect more current data and present their findings to other members of their class. |

1. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

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| Topic | Contribution to the development of the attribute(s) of the IB learner profile |
|  | With the “flattening” of the world as explained by Thomas Friedman, students are coming to realize that many skills from the past quarter century have become obsolete or can be done in distant locals for a fraction of the cost so they realise they need to develop skills are not as easily transferable. Critical thinking is a skill that is essential for the IB learner profile. The IB learner is willing and motivated to think critically and creatively so as to solve complex problems. |

1. Resources

Describe the resources that you and your student will have to support the subject. Indicate whether they are sufficient in terms of quality, quantity and variety. Briefly describe what plans are in place if changes are needed.

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